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TANGANYIKA
DEPARTMENT OF AGRICULTURE

Eighteenth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi 1951

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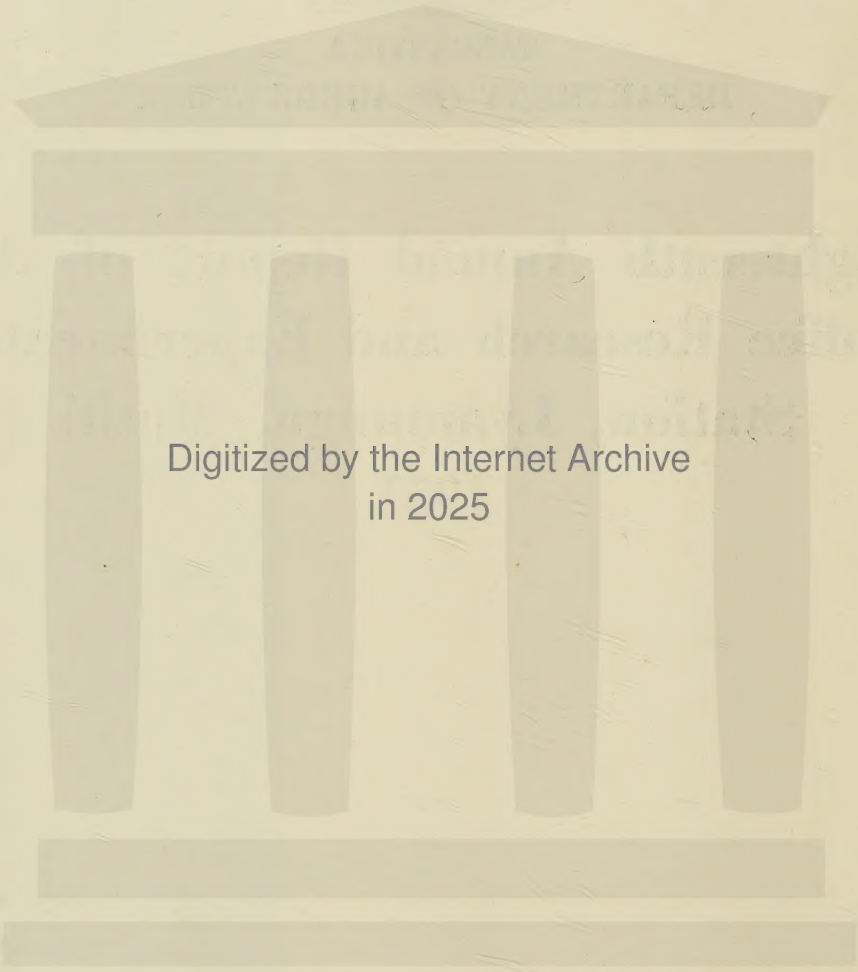

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CONTENTS

	Page
General	1
Improvement of Planting Material	2
Improvement of Growing Conditions	3
Liquoring	5
Vegetative Propagation	6
Off-Station Trials	6
Pests and Diseases	6
Animal Husbandry	7
Mbosi Sub-Station	7
Details and Analyses of Experiments:	
Improvement of Plant Material:	
Experiment XVIII	8—15
Experiment IV	15—16
Experiment II	16—22
Kents Plot Selections	23
Experiment I—Single Tree Selections	24
Experiment III	25
Experiment IIIA	25
Improvement of Growing Conditions:	
Experiment V	26—27
Experiment XV	28—29
Experiment XIVA...	30—31
Experiment IX	32—33
Experiment XIII	34—35
Experiment XX	36
Vegetative Propagation	36—38
Statement Showing Grades and Classification of the 1951-1952 Crop	39
Rainfall Records—September, 1944 to August, 1951	39

COFFEE RESEARCH AND EXPERIMENTAL STATION, LYAMUNGU, MOSHI

Report for the Period 1st January to 31st December, 1951

General

The following new experiments were planted in 1951 :—

(1) *Experiment IIIB.*—To compare the yields of seedlings of the original parent with second generation seedlings (from Experiment II), clones and seedlings of clones (from Experiment XVIII).

Material from three selections—H 66, N 5 and N 39—was used in this experiment which was laid out as a randomized block repeated six times.

(2) *Experiment XXI.*—To compare the yields resulting from three methods of conversion of young coffee to multiple stem, with coffee trained on the normal single stem, and one modification of the normal single stem system.

(3) *Experiment IA.*—To compare the effect on yield of mulches of *Cynodon plectachys*, and *Panicum maximum*, and Farmyard Manure.

(4) Two additional squares of the Clonal Selection Trials (Experiment XVIII) were also planted. The layout was amended to allow each clone to be grown on the single and multiple stem pruning systems, the suitability of each clone to the two systems can then be judged.

The potential crop in any one season is determined by the effect of the conditions existing in the previous season on the nutritional status of the tree. The last quarter of 1950 was generally dry, so dry in fact that it was considered necessary in December to strip the crop remaining on the trees. A fall of 0·73 inches of rain at the end of December, 1950 produced a small flowering, further rain in mid-January and mid-February resulted in heavy flowering and heavy flushes of vegetative growth; the demands on the tree by the vegetative growth and the heavy set of young cherry, resulted in some cherry fall in March and April. All these fallen cherries showed a blackening in one or both beans—a sign of carbohydrate deficiency at that particular time.

The rains of April to September, 1951, were up to the average, but those of October, November and December were abnormally high. Although the rains of this latter period ensured the ripening of the heavy crop, it also forced the trees into excessive vegetative growth to the detriment of flowering for the 1952 season.

The season's crop was equivalent to 71·50 tons of clean coffee, the average yield per acre was 12·17 cwts. The out-turn figure, debes of cherry per ton of parchment, was 380, this figure is lower than usual. (See page 39).

The quality of the coffee when finally cured was lower than in the previous season. The majority of the crop obtained a class 3, one lot only gaining a class 2. This lower classification is attributed to the difficulties experienced in drying the crop owing to the unfavourable weather conditions, and to the inadequacy of the drying space.

Some sixteen acres on Lyamungu Coffee Estate, adjacent to the new coffee experiments, were put down to grass with the object of restoring soil structure. The clearing on a further twenty acres was completed preparatory to grassing down.

Two thousand four hundred and sixty-one pounds of seed of the selections were sold to growers during the season.

Improvement of Planting Material

The recording of the yields of the clonal and seedling progeny of the selections, and of the parent trees in the Kents Plot and Experiment I was continued. (See pages 23 and 24).

In squares I, II, VII and VIII of Experiment XVIII the records of the clonal progeny plots of twenty-four mother trees are available for the first seven years of bearing. The lowest yield of any one of these in the fifth, sixth and seventh bearing years is at the rate of 9·7 cwts. per acre, in some cases sixteen cwts. per acre has been exceeded in each of the three seasons, the LI progeny plots, for example, yielded 18·12 cwts., 16·33 cwts. and 18·56 cwts. per acre in the respective years. (See pages 8, 9, 10 and 11).

The records of the yields of the clonal progeny plots in the other squares in this experiment are available for shorter periods. Some of the plots have yielded outstandingly well so far, for example, in Square III, KP 423 has a mean yield of 14·63 cwts. over its first five bearing years, and KP 154, 12·29 cwts. for the same period, the next highest yielder in this square being N 5 at 10·94 cwts. In Square IX, N 205 has a mean yield of 11·3 cwts. over six years. Other outstanding trees are KP 532 in Square X with a mean yield over six years of 12·8 cwts., KI 363, in Square XI, with 12·09 cwts., over four years, and KP 227, in Square XII, with 12·68 cwts. for a corresponding period. In Square XVII, KP 162 with a mean yield of 15·49 cwts. and N 34 with 12·53 cwts., over four years, have out-yielded the remainder of the trees in the square, the next highest being F 502 at 9·74 cwts. (See pages 9, 11, 12, 13 and 15).

As a whole, the Seedling Progeny Plots (Experiment II) bore very heavily in 1951, those of H 61 at the rate of 31·75 cwts. per acre. In most cases these high yields followed relatively poor crops in 1950, the H 1 plots, however.

cropped at the rate of 26·32 cwts. per acre after 11·10 cwts. and 14·67 cwts. respectively in the two previous seasons; similarly the F 840 plots bore at 25·56 cwts. per acre, following yields of 10·33 cwts. and 14·80 cwts. in the two previous seasons. (See pages 16, 17, 18, 19, 20, 21 and 22).

In Experiment III in which the yields of clones and seedlings of the same parent trees have been recorded, by plots, for a period of four years, (the eleventh to fourteenth years from planting), there is a significant difference in favour of seedlings when the means for the four-year period are compared. The differences in any one year are not significant. A similar comparison for the first seven years of bearing in Experiment IIIA shows no significant difference in yield; in this case, however, the clones yielded significantly higher than seedlings in the first two bearing years, in subsequent years there were no differences. The higher yield of the clones in the first two bearing years may have been due to their being larger plants than the seedlings at the time of planting.

A comparison of the yields for two years of the clonal and seedling progeny of each of the nine mother trees represented in Experiment IIIA also shows no significant differences.

From the above results, and the fact that no differences in liquoring quality occur between beans produced by the clones and seedlings, it may be concluded that in view of the cost of production of clones, it is economically sound to plant seedlings.

In the Kents Plot the mother tree KP 423 has a mean yield, over a fourteen-year period, of the equivalent of 14·69 cwts. of clean coffee per acre. This tree has been grown on the single stem system. Its clonal progeny plots, grown on the multiple stem system in Square III, Experiment XVIII, have a mean yield of 14·63 cwts. for the first five bearing years. In the first bearing year the yield was 6·82 cwts. in each of the subsequent years it has borne at the rate of 13·48 cwts. or more, in the 1950 season it yielded 26·18 cwts. and this was followed by 12·55 cwts. in 1951. (See pages 23 and 9).

The mother tree No. 33 in Experiment I has, over a similar fourteen-year period, a mean yield of 17·51 cwts. per acre. There are six other mother trees in this Experiment which have a mean yield of 15 cwts. or more for the same fourteen-year period. Clonal progeny of these trees is being produced for yield trials. (See page 24).

Improvement of Growing Conditions

Ten years' records are available from Experiment V in which the effects of mulch (elephant grass), compost and Sulphate of Ammonia, each at three levels, are being investigated. The findings confirm those of previous years, namely, that of these treatments, compost only has effected

a significant increase in yield over the whole period. The lower rate of one debe per tree is as effective as twice this rate.

The analysis of this experiment indicates that both the mulch and Sulphate of Ammonia might be effective when each is applied alone, but that Sulphate of Ammonia when applied together with mulch, or compost, tends to depress yields. The application of mulch and compost together does not appear to effect an increase in yield over and above that obtained by compost alone. (See pages 26 and 27).

Experiment XV in which mulch (banana trash) and irrigation, each at four levels, are the treatments, has also been recorded for ten years. Again the results bear out those of previous years. Each treatment singly, and in all combinations, brings about increases in yields over the nil treatment. The overall effect of mulch, and of irrigation, is significant, and the combinations of mulch and irrigation each give a significant increase over mulch alone, or irrigation alone. The optimum combination appears to be 40 lb. of mulch and the lowest irrigation treatment (rainfall made up to two inches per month).

Analysis of the yields, for the ten-year period, of the four clones used in this experiment shows that the differences in degree of response to the mulch treatments are significant, but only at the five per cent level. (See page 28).

It can be inferred from this that different clones may respond differently to any specific treatment, confirmation of this will be required from other experiments designed for this purpose. In the meantime it is an important point to note, it stresses the inadvisability of using the progeny, clonal or seedling, of a single tree only in any experiment designed to test the effects of treatments on coffee generally.

In Experiment XV the application of banana trash at 80 lb. per tree resulted in a significant increase in yield, and in Experiment V the application of compost at the same rate was shown to be effective. These results are not confirmed in Experiment XIVA, although mulch has given a slight increase. This may be due to the fact that Experiment XIVA is sparsely shaded with *Albizzia maranguensis*, whereas Experiments V and XV are without shade, or to the different planting material used in each case, or to a combination of these two factors.

As was expected, the 1951 results of the cultivation Experiment (IX) did not alter materially the findings of previous years, over the whole period of the experiment cultivation with the forked jembe has been the slightly better treatment, but not significantly so.

In the method of pruning Experiment (XIII) all three treatments yielded at over 15 cwts. per acre in the 1951 season. Over the fourteen-year period the trees grown on the normal multiple stem system have yielded thirty-two per cent more than those grown on the single stem system, this amounts to a mean increase of 2·87 cwts. per acre per annum. (See page 34).

At the end of 1948 an experiment was commenced to assess the effect of the time of pruning on the yield of shaded single stem coffee; the coffee was twelve years old. The treatments consist of pruning from one to six months after the harvesting of the crop has been completed. Three years records are now available and these show that each delay of one month in pruning has resulted in a reduction of crop. The difference in yield between those plots pruned immediately after crop and those pruned five months later, is forty-seven per cent, this amounts to 4·84 cwts. per acre per annum. (See page 36).

Liquoring

In connection with the yield trials of the clonal and seedling progeny of the selections, (Experiments XVIII and II), samples were submitted for liquoring. From the results for four consecutive seasons the following clones are the most promising from the point of view of quality, N 39, I 60, N 30, N 5, N 218 and N 76. These, all of which are selections within the Bourbon variety, attained a Class I in at least two of the four years.

The most promising for quality from the seedling progeny of the selections are N 39, L 1, N 197, N 182 and N 81, all these are of the Bourbon variety and attained a Class I in at least two out of the four years. F 502 and H 61 are the best from within Kents, these also were adjudged Class I in two of the four years.

In the experiment in which the effect of the age of tree on liquoring capacity is being investigated, and in which annual planting was carried out over a period of eight years, no differences in quality attributable to age have occurred over a period of three years. There is also no difference in the quality of the coffee produced by trees pruned on the single stem system as compared with that from the multiple stem system, but there is an indication that Bourbon is of better quality than Kents.

Over a period of four consecutive years samples from the various treatments in the mulch, irrigation and fertilizer experiments have been liquored. None of the treatments have had any apparent effect on quality.

Experiments were undertaken to investigate the causes of "fruity" and "onion" taints, but no positive results were obtained. The "onion" taint which appeared in certain other samples, did not disappear after storage. There was an indication that certain selections, R3 for example, were more susceptible to the "onion" or unclassified taints.

It has been suggested that "woody" flavour may be produced as a result of the exposure of clean coffee to conditions of high atmospheric humidity. Samples kept over water in a closed container for six weeks did not develop this flavour. It is of interest to note, however, that those kept over tap water were two classes lower than those kept over distilled water.

There was high incidence of amber and semi-amber beans during the season, and a large number of the selections produced beans of these types.

Bean samples of N 39 grown on the Station have been readily recognised by the Liquorer, these characteristics were retained when N 39 was grown on an estate at Usa River.

Vegetative Propagation

As a result of the improvement in technique over the last four years, the percentage of cuttings rooting within six months of being set in the frames has increased from 36·44 to 85·48 and the deaths after rooting have been reduced from 15·88 per cent to 4·7 per cent.

Further experiments to find out the best type of cutting, the effect of growth substances and the effect of season on rooting, were carried out. These are described on pages 36 to 38.

Off-Station Trials

A further six off-Station clonal trials were planted, three of which were on the Moshi Native Coffee Board plots and the remaining three on estates, one at Oldeani and two at Usa River.

Pests and Diseases

Leaf miner *(Leucoptera spp.)* caused fairly heavy leaf fall in the first quarter of the year. It was again in evidence at the end of the year, but the rains at that time produced a new flush of growth which was not seriously affected.

Coffee Berry Moth *(Thliptoceras octoguttalis)* was noticeable all through the coffee, the highest incidence appeared to be in Experiment XV (Irrigation and Mulch).

The number of coffee trees affected by Stem Borer *(Anthores leuconotus)* continued to increase whilst the mealy bug, *Pseudococcus filamentosus*, which in previous seasons had been prevalent in certain parts of the Station, practically disappeared.

Green scale *(Coccus africanus)* appeared sporadically towards the end of the year, the young coffee in Experiment IIIB was the most affected.

The incidence of *Antestia lineaticollis* was kept under control by spraying with D.D.T.

The pre-monsoon spraying with Bordeaux mixture to control *Hemileia vastatrix* was not as effective as in some previous years. This was due, probably, to the abnormal rains in February which created conditions which allowed infection to occur before the leaves were sprayed. As a result of the high incidence of the disease there was heavy leaf fall in June and July. Conditions, however, were favourable for vegetative growth for the remainder of the year, and the trees ripened up their very heavy crop with very little sign of die-back.

Animal Husbandry

Thirty-nine calves were born during the year, twenty-one being heifers.

The total milk production amounted to 6,035 gallons from forty-three cows.

Several of the progeny of the Sahiwal-Boran cross bull have completed their first lactation, three out of thirteen yielded over 300 gallons, one reaching 360·8 gallons in 298 days. Of the remaining ten only four failed to reach the 200 gallons.

There were two cases of "fly", both recovered after treatment. One cow was lost from milk fever.

Mbosi Sub-Station

Investigational work on the causes of "black" or "wither" tip of coffee in the Mbosi district was continued. Originally, it was considered that Boron deficiency might be the cause, but the spraying and injection of affected trees with Boron compounds failed to correct the condition. The possibility of a deficiency of one of the other minor elements being the cause is being investigated by the Government Chemist.

In order to establish whether climatic conditions were a factor in the incidence of "wither" tip, coffee growing under field conditions has been given protection from wind and sun. In addition, coffee seedlings are being grown under partially controlled conditions in a greenhouse.

The field experiments with phosphatic manures, and the selection trials, have been maintained. Considerable difficulty is being experienced in establishing a full stand of seedlings.

Visitors

Visitors to the Station included the Honourable the Director of Agriculture, the Commissioner for Co-operative Development and representatives of firms interested in the industry.

A successful Planters' Day was held in October.

I wish to record my thanks to Mr. W. R. Forder, Liquorer to the Coffee Board of Tanganyika, for reporting on many coffee samples.

I wish also to express my appreciation of the work done by the Staff of this Station.

Coffee Research Station,
Lyamungu, Moshi,
February, 1953

F. R. Sanders,
Senior Research Officer

DETAILS AND RECORDS OF EXPERIMENTS

All yields are expressed as cwts. of clean coffee per acre.

Unless otherwise stated, an out-turn figure of sixteen per cent has been used when converting weights of cherry to their equivalent in clean coffee.

A difference between any two treatments greater than the figure given as "Significant difference" can be considered as being due to the particular treatment. Unless otherwise stated, the figure for significant difference is at the level of probability of P = 0·05, at this level of probability the chances against drawing the wrong conclusion by using the significant difference figure is nineteen to one.

EXPERIMENT XVIII—CLONAL SELECTION TRIALS

These trials consist of a series of 6 x 6 latin squares, wherein the yields of rooted cuttings of potential selections are compared. Planting commenced in April, 1943; additional squares have been planted up subsequently, as material became available. By the end of 1951 sixteen squares had been planted, of which fourteen were in bearing. All squares planted prior to April 1944 (eight in number) have been pruned on the single stem system; those planted subsequently have been grown on multiple stem. Each square is planted with the following shade tree, so that each of the six plots of any one clone has a different semi-permanent shade tree.

Semi-permanent:—

Albizzia moluccana
Albizzia stipulata
Albizzia sp. ("Tangasale")
Cordia holstii
Ficus sycamorus
Maesopsis eminii

Permanent:—

Albizzia Maranguensis

Yearly yields and mean yields for each square are given below, the calculated yields of the original parents being included for reference.

EXPERIMENT XVIII—LATIN SQUARE I.—PLANTED 29.4.43—SINGLE STEM

PARENT										Mean of 7 years 1945-51	
Mean Yield	No. of years re-corded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	Cwts.	Per-cent-ages
16·83 ...	7	N 39	4·84	1·30	*13·61	2·46	11·49	15·53	16·35	9·37	98
10·17 ...	7	R 23	1·29	1·44	12·32	0·52	16·94	10·40	17·68	8·64	90
13·59 ...	7	N 71	1·37	2·18	12·09	1·12	16·36	12·73	17·41	9·03	94
32·48 ...	1	I 60	2·04	3·52	14·98	1·10	16·45	18·51	15·29	10·24	107
6·69 ...	4	M 2	1·90	3·37	12·07	1·97	15·02	15·42	18·30	9·74	102
11·44 ...	8	L 1	2·33	2·04	14·45	1·23	18·12	16·33	18·56	10·45	109
Mean			2·29	2·31	13·25	1·40	15·73	14·82	17·24	9·58	100
Standard Error			0·26	0·45	–	0·32	0·82	1·59	1·37	0·26	3
Significant Difference (P = ·05) ...			0·76	1·32	–	0·94	2·42	4·70	–	0·76	8

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE II.—PLANTED 30.4.43—SINGLE STEM

PARENT										Mean of 7 years 1945-51	
Mean Yield	No. of years re-corded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	Cwts.	Per-cent-ages
17·12 ...	7	N 20	1·44	2·22	10·54	1·25	13·25	14·85	13·88	8·20	90
12·54 ...	7	N 30	2·98	0·95	10·54	0·86	12·61	11·84	17·94	8·26	91
14·39 ...	7	N 29	3·03	2·43	12·31	1·59	13·71	12·93	18·47	9·21	102
14·55 ...	7	N 5	5·29	0·93	*12·92	1·06	10·92	12·76	20·95	9·25	102
32·04 ...	1	N 48	2·06	2·43	10·81	0·73	15·20	16·04	14·14	8·79	97
13·88 ...	7	N 197	4·17	5·33	*14·07	1·60	15·92	18·38	15·20	10·68	118
Mean			3·17	2·39	11·87	1·18	13·60	14·50	16·79	9·07	100
Standard Error			0·33	0·46	–	0·18	0·81	1·43	1·28	0·31	3
Significant Difference (P = ·05) ...			1·39	1·35	–	0·53	2·38	4·22	3·78	0·91	10

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE III.—PLANTED 26.10.44—MULTIPLE STEM

PARENT								Mean of 5 years 1947-51	
Mean Yield	No. of years recorded	Clone	1947	*1948	*1949	*1950	*1951	Cwts.	Per-cent-ages
14·55	7	N 5	*6·26	11·42	14·39	11·88	10·87	10·94	100
13·77	6	AB 35	4·56	11·60	11·63	13·79	11·84	10·68	97
11·49	12	KP 154	3·25	13·40	15·33	19·98	9·55	12·29	112
14·78	12	KP 423	6·82	13·48	14·12	26·18	12·55	14·63	133
5·04	4	M 97	5·51	10·51	10·99	9·29	8·66	9·00	82
12·13	7	N 106	5·79	8·10	10·24	10·12	7·51	8·34	76
Mean			5·37	11·42	12·78	15·20	10·16	10·98	100
Standard Error			–	0·62	0·93	1·36	1·15	0·37	3
Significant Difference (P = ·05)			–	1·84	2·73	4·01	3·39	1·10	10

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE VII.—PLANTED 7.6.43—SINGLE STEM

PARENT										Mean of 7 years 1945-51	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	Cwts.	Percentages
13·87 ...	7	R 15	3·63	2·50	*13·13	0·94	17·81	15·86	16·54	10·06	108
11·23 ...	7	N 81	3·76	3·65	15·43	2·92	16·39	14·04	16·89	10·43	112
9·60 ...	12	KP 228	2·80	2·80	14·62	5·79	14·37	18·06	18·54	11·00	118
10·45 ...	7	I 49	2·14	1·43	10·78	1·24	14·75	18·76	10·17	8·47	91
3·75 ...	3	S 16	2·32	0·95	10·43	1·18	11·33	12·09	11·20	7·07	76
15·19 ...	7	N 34	1·68	1·90	10·57	1·28	17·57	17·07	12·33	8·93	96
Mean			2·73	2·21	12·49	2·23	15·37	15·99	14·28	9·33	100
Standard Error			0·44	0·38	–	0·42	0·78	1·61	0·83	0·39	4
Significant Difference ... (P = ·05)			1·30	1·12	–	1·25	2·30	–	2·45	1·15	12

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE V.—PLANTED 14.4.49—MULTIPLE STEM

PARENT			1951 Crop	
Mean Yield	No. of years recorded	Clone	Cwts.	Percentages
11·44	8	L 1	3·57	110
16·19	5	X 208	3·13	97
12·32	5	U 329	3·19	98
13·66	5	Q 89	3·14	97
16·60	5	X 216	3·57	110
8·89	10	AB 37	2·81	87
Mean			3·24	100
Standard Error			0·44	13
Significant Difference			–	–

EXPERIMENT XVIII—LATIN SQUARE VI.—PLANTED 15.4.49—MULTIPLE STEM

PARENT			1951 Crop	
Mean Yield	No. of years recorded	Clone	Cwt.	Percentages
16·83	7	N 39	4·16	150
14·23	7	N 219	3·73	98
15·19	5	X 125	2·46	88
11·85	14	KP 146	2·64	95
16·34	5	X 297	3·06	110
12·13	7	I 89	1·64	59
Mean			2·78	100
Standard Error			0·55	20
Significant Difference			–	–

EXPERIMENT XVIII—LATIN SQUARE VIII.—PLANTED 13.8.43—SINGLE STEM

PARENT										Mean of 7 years 1945-51	
Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	Cwts.	Percentages
14·02 ...	7	R 2	2·38	4·55	13·75	1·28	19·36	9·71	17·23	9·75	97
11·27 ...	4	H 66	2·58	3·47	*20·28	7·72	14·55	18·18	16·83	11·95	119
6·14 ...	4	M 7	1·46	3·48	11·24	1·96	17·22	12·32	13·83	8·75	87
11·95 ...	6	AB 92	0·95	3·20	11·43	2·36	16·16	15·32	13·68	9·02	90
15·04 ...	7	N 218	2·23	2·25	14·62	3·26	16·17	13·57	17·32	9·99	100
13·58 ...	7	N 100	2·22	4·65	*14·30	1·77	20·09	13·69	17·98	10·67	106
Mean			1·97	3·59	14·27	3·06	17·34	13·79	16·15	10·01	100
Standard Error			0·35	0·47	–	0·68	1·20	1·20	1·26	0·31	3
Significant Difference (P = ·05) ...			1·02	1·38	–	2·00	2·54	3·54	–	0·91	9

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE IX.—PLANTED 20.12.43—SINGLE STEM

PARENT									Mean of 6 years 1946-51	
Mean Yield	No. of years recorded	Clone	1946	1947	*1948	*1949	*1950	*1951	Cwts.	Percentages
10·49 ...	6	AC 98	4·07	9·54	4·24	14·07	11·42	10·88	9·06	92
18·38 ...	7	R 3	5·22	10·12	1·70	18·43	6·54	14·81	9·48	96
10·62 ...	12	KP 683	4·46	13·63	4·78	14·54	8·33	12·09	9·63	98
14·07 ...	7	N 205	6·60	13·02	3·10	18·30	10·73	16·03	11·29	115
10·94 ...	7	N 128	4·87	12·91	1·75	17·37	5·02	16·37	9·74	99
11·29 ...	7	I 5	4·58	10·39	2·87	17·52	7·83	15·57	9·79	99
Mean			4·96	11·60	3·07	16·71	8·31	14·29	9·84	100
Standard Error			–	–	0·51	1·36	1·26	0·86	0·40	4
Significant Difference (P = ·05)			–	–	1·40	–	3·72	2·53	1·18	12

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE X.—PLANTED 29.12.43—SINGLE STEM

PARENT			1946	1947	*1948	*1949	*1950	*1951	Mean of 6 years 1946–51	
Mean Yield	No. of years recorded	Clone							Cwts.	Per-cent-ages
36·90 ...	1	N 110	4·79	12·99	3·02	11·45	11·03	10·48	8·96	86
7·37 ...	3	M 95	4·13	11·16	0·93	13·22	13·25	7·58	8·38	81
11·28 ...	12	KP 532	5·36	16·03	8·32	14·84	15·50	17·01	12·84	124
13·88 ...	7	N 197	9·50	*13·70	3·13	17·31	16·02	10·79	11·74	113
11·98 ...	7	I 235	5·15	12·05	2·38	15·73	15·55	12·08	10·49	101
11·71 ...	7	R 11	5·18	11·14	1·62	16·45	11·97	12·24	9·77	94
Mean			5·69	12·85	3·24	14·83	13·89	11·69	10·27	100
Standard Error			–	–	0·64	0·85	1·63	1·10	0·34	3
Significant Difference (P = ·05)			–	–	1·90	2·50	–	3·24	1·00	10

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XI.—PLANTED 16.4.46—MULTIPLE STEM

PARENT		Clone	*1948	*1949	*1950	*1951	Mean of 4 years 1948-51	
Mean Yield	No. of years recorded						Cwts.	Per-cent-ages
9·22	11	KI 363	3·01	16·34	13·92	15·10	12·09	123
13·88	7	N 197	1·18	10·91	14·93	6·05	8·26	84
13·58	7	N 100	1·80	12·88	17·65	8·20	10·13	103
18·38	7	R 3	1·20	10·68	12·21	6·81	7·73	78
14·55	7	N 5	1·67	18·14	12·99	10·23	10·76	109
16·83	7	N 39	1·08	14·56	12·53	12·43	10·15	103
Mean			1·66	13·91	14·04	9·80	9·86	100
Standard Error			0·21	0·91	1·18	0·89	0·51	5
Significant Difference (P = ·05)			0·61	2·69	3·48	2·63	1·50	15

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XII.—PLANTED 16.4.46—MULTIPLE STEM

PARENT			*1948	*1949	*1950	*1951	Mean of 4 years 1948-51	
Mean Yield	No. of years recorded	Clone					Cwts.	Per-centages
10·81	12	KP 227	3·16	17·89	18·65	11·00	12·68	119
11·81	7	N 181	3·50	17·94	11·20	7·69	10·09	95
13·58	7	N 100	3·29	13·93	16·20	6·14	9·87	93
10·03	7	R 24	1·76	11·99	16·40	5·08	8·81	83
13·11	12	KP 231	0·89	12·41	19·24	8·97	10·39	98
12·55	12	KP 163	3·32	18·53	17·77	8·42	12·02	113
Mean			2·65	15·45	16·57	7·88	10·64	100
Standard Error			0·55	1·15	1·15	0·81	0·64	6
Significant Difference (P=·05)			1·62	3·39	3·38	2·40	1·87	18

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XIII.—PLANTED 26.4.46—MULTIPLE STEM

PARENT			*1948	*1949	*1950	*1951
Mean Yield	No. of years recorded	Clone				
11·27	5	X 321	2·71	13·69	17·86	12·63
10·76	6	AC 189	3·49	7·71	13·12	6·97
13·58	7	N 100	0·79	8·60	19·21	6·32
13·87	7	R 15	–	–	9·86	8·88
6·74	12	KP 162	–	–	10·40	12·15
10·49	6	AC 98	–	–	11·56	9·71

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XIV.—PLANTED 21.5.47—MULTIPLE STEM

PARENT			*1949	*1950	*1951	Mean of 3 years 1949-51	
Mean Yield	No. of years recorded	Clone				Cwts.	Per-centages
18·38	7	R 3	0·38	6·56	10·38	5·77	83
15·20	7	N 50	0·57	6·44	7·40	4·80	69
15·87	4	H 1	0·49	5·92	14·73	7·04	103
10·59	6	AC 53	0·42	8·52	11·96	6·97	101
36·90	1	N 110	0·58	8·59	15·29	8·15	118
Unknown	–	KIL 10	0·46	6·31	19·45	8·75	127
Mean			0·49	7·06	13·20	6·91	100
Standard Error			0·13	0·92	1·15	0·64	9
Significant Difference (P=·05)			–	–	3·39	1·87	27

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XV.—PLANTED 26.1.44—SINGLE STEM

PARENT			1946	1947	*1948	*1949	*1950	*1951	Mean of 6 years 1946-51	
Mean Yield	No. of years recorded	Clone							Cwts.	Per-cent-ages
11·95 ...	6	AB 11	1·63	12·63	2·61	11·99	9·55	5·56	7·33	105
15·20 ...	7	N 50	0·82	9·82	1·72	13·88	7·34	6·55	6·69	95
11·44 ...	8	L 1	1·17	13·66	2·74	13·52	6·69	8·09	7·65	109
9·32 ...	12	KP 263	1·54	9·62	6·38	8·29	11·60	4·43	7·00	100
11·83 ...	7	I 47	1·23	10·73	2·23	12·31	5·88	7·82	6·70	96
14·08 ...	7	N 215	1·95	9·97	1·79	11·91	5·81	8·56	6·66	95
Mean			1·39	11·07	2·91	11·99	7·81	6·83	7·01	100
Standard Error			–	–	0·61	1·00	1·00	0·75	0·32	5
Significant Difference (P=·05)			–	–	1·79	2·94	2·96	2·22	–	–

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XVI—PLANTED 3.3.44—SINGLE STEM

PARENT			1946	1947	*1948	*1949	*1950	*1951	Mean of 6 years 1946-51	
Mean Yield	No. of years recorded	Clone							Cwts.	Per-cent-ages
11·27 ...	7	N 198	0·72	7·93	2·67	13·30	11·44	11·66	7·96	97
18·38 ...	7	R 3	0·66	7·88	0·87	13·23	10·90	11·89	7·58	92
8·38 ...	7	R 25	0·66	7·04	2·01	11·49	9·96	12·59	7·29	89
12·63 ...	7	N 76	0·83	8·83	3·89	13·77	14·09	10·74	8·69	106
13·31 ...	7	N 220	0·86	4·85	2·87	10·52	9·88	11·04	6·67	81
13·88 ...	7	N 197	1·33	*9·29	5·34	17·66	19·68	13·76	11·18	136
Mean			0·85	7·64	2·94	13·23	12·66	11·95	8·23	100
Standard Error			–	–	0·60	0·70	0·87	0·54	0·28	3
Significant Difference (P=·05)			–	–	1·78	2·08	2·57	1·59	0·83	10

*Using actual out-turn.

EXPERIMENT XVIII—LATIN SQUARE XVII.—PLANTED 13.9.45—MULTIPLE STEM

PARENT Mean Yield	No. of years recorded	Clone	*1948	*1949	*1950	*1951	Mean of 4 years 1948-51	
							Cwts.	Percentages
6·74	12	KP 162	6·76	17·91	24·94	12·45	15·49	146
15·19	7	N 34	7·20	15·79	19·37	7·73	12·53	118
14·71	7	N 14	1·90	8·89	11·44	7·65	7·49	70
12·66	7	I 56	4.84	11·81	15·35	6·40	9·62	90
18·38	7	R 3	4·99	11·86	12·89	6·21	8·99	84
7·13	7	F 502	6·05	9·94	16·54	6·35	9·74	92
Mean			5·29	12·70	16·75	7·80	10·64	100
Standard Error			0·91	1·05	1·09	1·03	0·68	6
Significant Difference (P=·05)			2·67	3·10	3·33	3·02	2·06	19

*Using actual out-turn.

EXPERIMENT IV—SQUARES II, V AND IX—CLONAL SELECTION TRIALS

The three original squares in Experiment IV were uprooted, because of the unsuitability of the various exotic coffee planted therein. As material became available, they were each replanted with the same five clones, Squares II and V being grown on the single stem system and Square IX on multiple stem. The spacing is 8 ft. x 8 ft. apart.

The results have been disappointing, probably due to the heavy shade, prior to 1948, of *Acrocarpus fraxinifolius*, *Cordia holstii*, and *Albizzia maranguensis*, and the previous existence of coffee in the area. The yields in 1949, 1950 and 1951 have however, shown considerable improvement.

EXPERIMENT IV—LATIN SQUARE V.—PLANTED 9.4.42—SINGLE STEM

PARENT Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 7 years 1945-51	
										Cwts.	Percentages
16·83	7	N 39	2·47	Crop Failed	3·28	5·76	4·82	21·78	9·68	6·76	93
18·38	7	R 3	4·37		8·52	0·88	10·30	12·45	11·77	6·73	93
11·44	8	L 1	3·86		9·58	1·51	11·12	16·78	11·85	7·63	105
13·58	7	N 100	2·97		9·74	0·93	11·66	14·98	11·60	7·21	99
13·88	7	N 197	4·23		10·09	2·65	11·27	18·84	10·35	8·01	110
Mean			3·58		8·24	2·35	9·83	16·97	11·02	7·27	100
Standard Error			0·33		–	0·459	0·94	1·21	0·80	0·31	4
Significant Difference (P=·05)			1·02		–	1·415	2·91	3·72	–	–	–

*Using actual out-turn.

EXPERIMENT IV—LATIN SQUARE II.—PLANTED 13.4.43—SINGLE STEM

PARENT Mean Yield	No. of years recorded	Clone	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 7 years 1945-51 Cwts.	Mean of 7 years 1945-51 Percentages
16·83 ...	7	N 39	1·11	Crop Failed	4·84	2·34	5·63	16·41	11·44	5·88	93
18·38 ...	7	R 3	1·31		6·56	0·38	9·70	10·13	10·94	5·43	86
11·44 ...	8	L 1	1·40		8·21	1·51	12·52	14·78	12·61	7·13	113
13·58 ...	7	N 100	1·19		7·64	1·01	9·90	12·88	12·19	6·24	99
13·88 ...	7	N 197	1·64		8·08	1·48	10·23	15·60	11·35	6·75	107
Mean			1·33		7·07	1·34	9·60	13·96	11·69	6·29	100
Standard Error			0·15		–	0·351	0·64	0·94	0·87	0·18	3
Significant Difference (P=·05) ...			0·45		–	1·083	1·98	2·90	–	0·54	9

*Using actual out-turn.

EXPERIMENT IV.—LATIN SQUARE IX.—PLANTED 17.3.44—MULTIPLE STEM

PARENT Mean Yield	No. of years recorded	Clone	*1948	*1949	*1950	*1951	Mean of 4 years 1948-51 Cwts.	Mean of 4 years 1948-51 Percentages
16·83	7	N 39	2·19	11·30	4·05	12·61	7·53	109
18·38	7	R 3	2·34	7·18	6·22	10·10	6·45	93
11·44	8	L 1	1·94	7·09	7·71	5·58	6·28	91
13·58	7	N 100	2·61	9·30	7·03	8·60	6·87	99
13·88	7	N 197	2·86	10·08	7·78	9·35	7·51	108
Mean			2·39	8·99	6·55	9·77	6·93	100
Standard Error			0·440	1·06	0·65	1·15	0·46	7
Significant Difference (P=·05)			–	–	1·99	–	–	–

*Using actual out-turn.

EXPERIMENT II—SEEDLING SELECTION TRIALS

These trials are laid out in the form of four 6 x 6 latin squares, and two randomized blocks, each with nine selections repeated six times. The object of the experiment is to compare the yields of seedling progeny of potential selections under the conditions existing at this Station. The area has high light shade of *Albizzia maranguensis*, *Cordia Holstii*, and *Leucaena glauca*.

The yearly yields, and means over the bearing period, are given below and are expressed as cwts. of clean coffee per acre. The calculated yields of the parent trees, from which the original seed was obtained, are also given as a matter of interest, together with the number of years for which each tree was recorded. No direct comparison between these latter is possible, however, except where they bear the same initial letter, since they originate from estates often in widely differing districts.

EXPERIMENT II.—LATIN SQUARE I.—PLANTED MAY, 1938—SINGLE STEM.

SUMMARY OF RESULTS FOR 1941–51

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1941	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 11 years 1941—1951	
Mean Yield	No. of years recorded													Cwts.	Percentages
7·13 ...	7	F 502	1·32	2·65	6·82	8·42	3·94	5·02	16·32	4·14	14·00	6·35	17·55	7.87	124
15·00 ...	5	P 280	1·21	4·35	7·01	7·87	2·55	4·85	13·84	1·80	12·15	5·48	14·57	6·88	108
11·88 ...	5	P 313	0·95	4·60	6·17	8·30	2·57	4·45	13·78	4·37	12·12	6·63	17·73	7·43	117
12·32 ...	5	P 348	0·84	2·07	4·43	6·38	1·19	5·31	9·75	4·63	9·42	5·05	14·90	5·81	91
13·17 ...	5	P 147	0·73	1·57	3·82	5·96	1·54	4·20	10·09	4·88	8·99	6·32	15·19	5·75	90
13·34 ...	5	P 190	0·77	1·29	1·53	3·69	0·87	3·63	6·56	6·78	6·22	5·87	11·70	4·45	70
Mean			0·97	2·76	4·96	6·77	2·10	4·58	11·72	4·43	10·50	5·95	15·27	6·36	100
Standard Error			–	0·29	0·33	0·42	0·38	0·51	0·73	0·70	1·06	0·60	1·07	0·27	4
Significant Difference			–	1·55 (P=·001)	0·96 (P=·05)	1·24 (P=·05)	1·12 (P=·05)	–	2·17 (P=·05)	2·06 (P=·05)	3·11 (P=·05)	–	3·16 (P=·01)	0·80 (P=·001)	13

*Using actual out-turn.

EXPERIMENT II.—LATIN SQUARE III.—PLANTED OCTOBER 1938—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–51

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 10 years 1942–51	
Mean Yield	No. of years recorded												Cwts.	Percentages
15·07 ...	4	H 1	1·34	4·85	8·36	3·64	1·82	15·78	7·55	14·67	11·10	26·32	9·54	119
8·75 ...	7	F 840	0·90	4·57	7·87	3·65	3·44	15·96	4·33	14·80	10·33	25·56	9·14	114
11·88 ...	5	P 313	3·13	4·30	5·87	0·75	2·29	11·24	1·26	14·83	6·42	22·23	7·23	91
13·75 ...	7	N 69	1·83	5·42	5·06	1·53	3·37	11·89	1·62	17·45	7·32	29·00	8·45	106
15·20 ...	7	N 50	1·54	4·77	4·55	1·08	2·61	10·81	1·45	15·55	6·25	23·68	7·23	91
6·57 ...	7	E 665	1·40	2·44	4·24	0·55	2·78	8·51	3·64	12·08	5·99	21·80	6·34	79
Mean			1·69	4·39	5·99	1·87	2·72	12·37	3·31	14·90	7·90	24·76	7·99	100
Standard Error			0·26	0·33	0·44	0·37	0·45	1·07	0·45	1·05	0·94	1·51	0·36	5
Significant Difference			1·39 (P=·001)	0·96 (P=·05)	1·30 (P=·05)	1·08 (P=·05)	–	3·14 (P=·05)	1·34 (P=·05)	3·09 (P=·05)	2·78 (P=·05)	4·46 (P=·05)	1·08 (P=·001)	14

*Using actual out-turn.

EXPERIMENT II.—LATIN SQUARE II.—PLANTED OCTOBER, 1938—SINGLE STEM.

SUMMARY OF RESULTS FOR 1942–51

Yields calculated as cwts. of clean coffee per acre

PARENT													Mean of 10 years 1942–51	
Mean Yield	No. of years recorded	Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	Cwts.	Percentages
15·04 ...	4	H 133	1·56	4·67	4·57	1·45	3·18	13·37	1·98	12·11	9·07	20·16	7·21	102
11·44 ...	8	L 1	1·13	4·86	4·42	2·05	3·52	14·42	4·45	12·92	9·87	23·34	8·10	115
9·39 ...	7	F 839	1·11	4·78	5·39	3·91	2·38	15·38	3·70	13·03	8·00	22·81	8·06	114
16·83 ...	7	N 39	0·93	3·09	3·35	3·46	3·04	12·86	6·48	7·99	12·48	21·27	7·47	106
13·17 ...	5	P 147	0·76	2·78	4·28	0·88	3·29	10·17	5·02	9·21	7·21	16·18	5·98	85
7·50 ...	7	E 59	0·69	2·04	3·94	0·88	3·20	8·62	5·74	7·04	5·88	17·02	5·52	78
Mean			1·03	3·71	4·29	2·10	3·10	12·47	4·56	10·38	8·75	20·13	7·05	100
Standard Error			0·27	0·37	0·24	0·33	0·44	0·69	0·73	0·65	0·67	1·11	0·21	3
Significant Difference (P=·05)			–	1·08	0·70	0·99	–	2·02	2·22	1·91	1·98	3·26	0·62	9

*Using actual out-turn.

EXPERIMENT II.—LATIN SQUARE IV.—PLANTED 1939—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–51

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 10 years 1942–51	
Mean Yield	No. of years recorded												Cwts.	Percentages
11·23 ...	7	N 81	0·94	1·56	2·78	0·01	1·28	6·60	1·29	9·08	7·28	18·45	4·93	83
16·83 ...	7	N 39	0·05	0·61	1·81	0·09	0·62	6·52	2·79	9·65	6·37	23·85	5·24	88
11·44 ...	8	L 1	0·75	1·65	3·53	0·12	1·59	10·27	1·52	11·28	6·44	19·08	5·62	94
15·07 ...	4	H 1	0·81	3·78	6·23	2·16	0·88	13·41	6·71	10·39	10·94	24·77	7·96	133
13·88 ...	7	N 197	0·55	2·19	3·37	0·12	2·61	10·51	2·70	13·30	9·20	23·46	6·80	114
18·38 ...	7	R 3	0·98	2·16	2·39	0·04	1·34	7·35	1·11	10·51	5·63	21·08	5·26	88
Mean			0·68	1·91	3·35	0·42	1·39	9·11	2·69	10·70	7·64	21·78	5·97	100
Standard Error			0·08	0·17	0·25	–	0·26	0·71	0·62	0·91	0·76	1·49	0·34	6
Significant Difference			0·44 (P=·001)	0·50 (P=·05)	0·74 (P=·05)	–	0·77 (P=·05)	2·10 (P=·05)	1·81 (P=·05)	2·69 (P=·05)	2·24 (P=·05)	4·38 (P=·05)	0·99 (P=·001)	17

*Using actual out-turn.

EXPERIMENT II.—RANDOMIZED BLOCK I.—PLANTED APRIL 1939—SINGLE STEM

SUMMARY OF RESULTS FOR 1942-51 CROP

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 10 years 1942–51	
Mean Yield	No. of years recorded												Cwts.	Percentages
11·71	7	R 11	0·83			1·95	1·17	9·65	2·07	16.20	5·37	22·83	6·14	90
14·02	7	R 2	0·65			1·68	1·32	9·51	3·09	16·80	6·98	20·48	6·18	91
14·49	4	H 61	0·72			5·94	1·21	13.93	8·99	16·62	7·77	31·75	8·86	130
Unrecorded		R.R.H.—vigorous	0·87			4·10	1·74	14·27	5·90	15·31	9·39	23·67	7·70	113
24·22	7	R 13	0·82			1·86	1·34	11·71	4·33	15·71	8·71	21·21	6·75	99
15·04	4	H 133	0·91			1·87	1·32	11·49	3·76	17·30	8·28	24·81	7·17	105
10·81	6	J 104	0·80			1·51	1·44	10·38	4·00	16·66	6·13	22·13	6·48	95
12·13	7	N 106	0·55			1·36	1·24	9·42	3·38	15·54	6·50	21·15	6·04	89
14·55	7	N 5	0·46			1·47	0·70	7·81	5·49	11·68	9·37	22·53	6·03	89
Mean			0·74	Crop Failed	Crop Failed	2·42	1·27	10·90	4·56	15·76	7·61	23·39	6·81	100
Standard Error			0·12			0·41	0·21	0·71	0·78	0·98	0·84	1·27	0·24	4
Significant Difference			0·21 (P=·2)			1·18 (P=·05)	–	2·03 (P=·05)	2·24 (P=·05)	2·80 (P=·05)	2·40 (P=·05)	3·62 (P=·001)	0·68 (P=·001)	10

*Using actual out-turn.

EXPERIMENT II.—RANDOMIZED BLOCK II.—PLANTED APRIL 1939—SINGLE STEM

SUMMARY OF RESULTS FOR 1942–51 CROP

Yields calculated as cwts. of clean coffee per acre

PARENT		Selection	1942	1943	1944	1945	1946	1947	*1948	*1949	*1950	*1951	Mean of 10 years 1942–51	
Mean Yield	No. of years recorded												Cwts.	Percentages
13·58	7	N 100	1·27	Crop Failed	Crop Failed	0·55	Crop Failed	10·11	1·50	13·46	6·22	18·90	5·56	105
13·59	7	N 217	0·58			0·59		9·38	1·74	13·76	8·03	14·63	5·26	99
13·93	7	R 1	1·13			0·48		9·15	2·11	12·99	6·73	16·08	5·24	99
12·63	7	N 229	0·89			0·35		7·79	1·51	14·37	7·23	14·99	5·04	95
15·19	7	N 34	1·24			0·45		9·33	1·54	12·22	5·99	15·98	4·93	93
7·69	7	E 325	0·52			0·63		6·87	4·27	11·00	7·58	16·73	5·03	95
12·76	7	N 182	0·83			0·62		6·88	4·49	11·65	8·79	21·68	5·73	108
14·08	7	N 215	1·03			0·49		8·06	2·44	11·90	6·88	16·61	5·04	95
12·41	6	J 49	1·37			0·64		10·26	1·63	16·20	5·80	18·75	5·86	111
Mean			1·10			0·53		8·64	2·36	13·06	7·03	17·15	5·30	100
Standard Error			0·17			–		0·77	0·54	0·86	0·87	1·05	0·24	5
Significant Difference (P=·05)			0·53			–		2·22	1·53	2·47	–	3·00 (P=·001)	–	–

*Using actual out-turn.

KENTS PLOT SELECTIONS—SINGLE STEM

Yields calculated as cwts. of clean coffee per acre

Tree No.	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	Mean of 14 years 1938-51
	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	Actual	Actual	16%	Actual	
KP. 146	25·14	15·36	31·23	7·98	12·90	12·05	17·06	3·82	1·70	11·63	15·31	2·72	2·89	6·06	11·85
KP. 147	28·17	3·75	8·23	11·29	1·53	10·78	7·72	12·90	T	6·45	1·26	7·14	4·50	5·43	7·80
KP. 151	8·60	12·11	7·38	8·06	1·36	3·73	12·30	7·38	4·92	8·99	9·03	8·83	4·33	9·82	7·63
KP. 154	12·71	17·74	9·33	13·75	0·59	12·30	2·38	11·46	1·10	22·15	30·56	3·78	23·59	3·31	11·77
KP. 162	10·95	24·66	20·03	0·68	16·12	STUMPED		0·17	0·08	2·38	4·79	0·94	4·67	1·69	6·23
KP. 163	19·43	22·34	10·95	5·77	13·58	13·24	17·06	3·31	3·82	16·80	13·56	10·67	10·69	13·83	12·50
KP. 164	9·20	12·28	6·45	5·77	5·01	5·52	17·65	3·22	8·32	25·88	31·04	13·82	31·40	10·47	13·29
KP. 176	9·33	12·33	15·95	9·08	0·59	2·21	8·74	0·17	4·33	9·08	4·66	7·22	6·36	7·98	7·00
KP. 204	8·01	14·70	7·81	16·12	1·78	10·78	10·95	10·01	14·68	18·24	3·71	22·24	0·34	8·57	10·57
KP. 214	6·79	28·17	1·27	11·63	6·36	5·86	5·60	–	0·59	5·18	–	8·89	3·39	4·84	6·33
KP. 215	3·25	30·35	8·66	6·11	5·09	13·15	28·43	6·28	14·68	21·81	4·78	26·28	5·01	12·10	13·28
KP. 218	8·26	27·05	6·87	1·78	3·82	9·08	13·24	3·51	8·49	13·24	3·91	22·82	5·43	8·89	9·73
KP. 226	7·10	27·43	6·19	10·95	–	6·70	6·79	1·76	3·56	4·67	7·86	2·94	5·94	0·75	6·62
KP. 227	11·90	22·49	16·29	17·48	0·93	12·81	12·64	T	4·92	16·55	0·29	13·42	10·27	4·08	10·29
KP. 228	13·39	25·34	7·81	8·15	0·85	8·74	7·72	5·69	6·19	13·49	1·70	16·11	5·86	6·60	9·12
KP. 231	14·37	16·86	25·20	1·02	3·31	11·37	19·26	4·58	5·60	17·23	14·29	24·16	9·33	18·39	13·21
KP. 260	7·84	12·87	8·32	11·96	2·80	10·52	12·64	11·71	9·25	22·83	1·60	33·76	2·38	18·04	11·89
KP. 261	9·57	11·54	10·01	3·39	2·72	7·21	10·78	6·28	7·81	7·64	12·26	5·71	10·52	1·34	7·63
KP. 262	11·20	14·43	12·13	11·63	0·42	20·79	7·64	15·10	10·61	16·97	1·78	8·36	9·16	12·51	10·91
KP. 263	10·98	19·46	7·01	16·38	1·02	12·13	10·86	4·07	6·79	8·49	5·94	8·79	8·49	9·02	9·25
KP. 265	13·10	14·62	9·33	9·33	3·31	19·86	13·92	7·64	18·16	14·60	20·13	9·88	23·93	5·67	13·11
KP. 266	9·90	10·95	8·57	5·43	0·34	6·45	12·47	3·48	17·74	6·53	14·78	5·13	16·97	1·87	8·62
KP. 281	8·25	12·24	7·72	0·08	0·76	11·80	15·19	0·93	4·92	2·72	6·92	20·50	17·57	8·62	8·44
KP. 285	9·42	12·30	6·87	18·75	1·53	16·46	15·10	3·14	14·51	9·50	12·39	15·50	19·77	3·84	11·36
KP. 289	8·35	11·83	10·10	13·41	0·17	15·58	13·15	3·48	7·64	21·38	2·68	19·11	3·31	14·13	10·17
KP. 352	9·05	22·01	0·68	14·17	–	11·63	6·96	4·92	6·02	11·12	18·05	10·65	20·79	14·55	10·76
KP. 362	7·41	13·10	11·12	19·52	3·73	15·78	3·90	11·29	3·65	15·02	22·79	7·01	22·49	3·73	11·47
KP. 405	6·74	14·70	2·46	2·80	2·72	12·13	15·02	5·26	10·10	17·23	28·80	18·00	24·52	8·67	12·08
KP. 406	9·62	10·93	9·33	4·16	4·33	14·93	14·09	6·87	10·78	11·37	28·49	14·80	19·09	8·37	11·94
KP. 409	9·88	13·88	5·35	9·25	3·99	10·16	10·44	8·83	11·80	10·78	19·39	11·88	23·17	5·53	11·60
KP. 412	10.01	13·69	7·64	13·58	2·80	9.84	7·89	8·57	2·63	12·81	12·61	13·39	18·67	6·37	10·04
KP. 414	10·52	11·76	7·02	6·62	1·78	10·61	6·70	6·45	7·38	8·74	24·77	7·83	23·76	1·73	9·69
KP. 423	10·49	14·15	10·95	17·99	5·94	29·62	3·99	20·03	7·55	29·02	8·16	19·35	4·84	23·54	14·69
KP. 466	8·68	12·36	6·78	14·51	0·34	15·10	8·32	9·08	1·19	14·51	12·38	22·93	10·01	9·06	10·37
KP. 512	10·27	11·15	2·89	15·78	2·12	15·78	10·36	7·04	6·62	9·25	18·16	22·08	6·36	12·47	10·74
KP. 518	5·74	14·87	2·29	13·07	3·99	10·52	10·18	6·70	1·78	8·57	8·68	2·70	14·34	3·17	7·61
KP. 532	8·51	12·51	9·50	19·52	3·14	13·92	11·96	1·10	4·75	15·53	20·47	14·38	15·44	1·10	10·85
KP. 683	18·35	12·47	6·62	15·61	2·04	16·29	4·24	14·93	0·51	9·25	11·36	15·67	12·30	17·51	11·23
KP. 685	11·56	12·83	6·11	11·96	0·85	12·98	6·53	15·95	3·39	15·02	10·63	24·47	10·18	20·69	11·65
VC. 276	7·41	14·19	14·85	6·70	8·32	8·83	9·08	4·07	9·59	7·13	16·62	2·27	13·75	–	–
VC. 363	7·64	14·91	5·60	9·50	12·47	12·73	0·59	13·32	5·35	3·31	15·96	0·08	10·95	–	–
VC. 364	6·93	14·90	8·40	8·49	13·49	6·28	0·34	14·09	6·02	7·89	21·91	1·20	6·02	–	–

T=Trace.

EXPERIMENT I—SELECTION

Yields calculated as cwts. of clean coffee per acre

Tree No.	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	Mean of 14 years 1938-51
	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	Actual	Actual	Actual	Actual	
11	8·99	4·56	7·81	21·30	8·23	33·35	–	41·66	0·85	23·39	10·37	10·35	–	4·54	12·74
33	4·41	13·85	3·56	22·15	6·53	25·72	–	54·05	–	29·11	43·09	11·21	14·13	17·27	17·51
55	14·09	3·79	13·92	13·24	9·84	23·59	–	38·27	2·04	49·73	1·28	25·08	2·34	19·27	15·46
71	14·17	1·64	10·61	21·55	16·63	23·93	1·19	44·89	0·51	42·26	1·15	20·04	1·17	19·59	15·67
179	13·32	2·04	6·53	21·30	2·12	37·75	3·05	39·03	–	25·03	1·47	6·88	1·29	6·65	11·18
188	15·51	–	10·27	15·02	11·96	17·14	1·27	44·21	0·59	46·06	5·71	24·94	0·88	17·38	15·00
197	13·72	1·36	10·86	14·43	7·21	21·64	8·74	50·26	0·59	26·24	20·80	13·43	3·17	15·87	14·95
200	13·88	0·08	9·25	13·41	12·98	26·98	–	45·40	–	38·36	3·39	24·22	0·82	17·45	14·73
255	13·85	–	10·52	19·86	3·05	19·77	–	49·90	–	41·24	4·14	29·25	2·52	18·66	15·20
339	16·97	0·17	13·24	7·81	11·96	27·83	–	42·85	1·95	34·54	17·35	22·38	2·17	15·86	15·36
448	15·24	1·10	14·60	10·10	5·18	26·48	–	46·16	6·70	46·08	1·65	31·55	T	15·04	15·71

T=Trace

EXPERIMENT III.—CLONES v. SEEDLINGS—PLANTED 1938

This experiment was originally designed to compare clones (rooted cuttings) with seedlings of the same parent, both by themselves and as root-stocks grafted with scions from another single mother-tree. The trees are pruned on the single stem system and the area is lightly shaded with *Albizzia maranguensis*. Although planted in 1938 (as a 4 x 4 latin square) difficulties regarding the technique of grafting in the field were experienced. The advent of the war, and consequent shortage of staff, aggravated the position, and even now there are a number of missing trees. In an endeavour to obtain further evidence regarding the respective merits of rooted cuttings and seedlings of the same parents (cf. Experiment IIIA below), it was decided to commence recording the yields of this experiment in 1948. Ten mother-trees are represented. Due allowance has been made in the analysis for the missing trees.

EXPERIMENT III.—ANNUAL AND MEAN YIELDS FOR FOUR YEARS, 1948-51, EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	*1948	*1949	*1950	*1951	Mean of 4 years 1948–51
Clones	8·83	15·75	9·09	14·37	12·14
Seedlings	12·16	16·12	12·80	15·08	13·94
Mean	10·50	15·94	10·94	14·73	13·05
Standard Error	1·80	1·87	1·63	1·74	0·14
Significant Difference	–	–	–	–	0·63 (P=·01)

*Using actual out-turn.

Seedlings have given a significantly higher yield than clones in this Experiment.

EXPERIMENT IIIA.—CLONES v. SEEDLINGS—PLANTED 1942

This is designed to give a straight comparison between clones (rooted cuttings) and seedling progeny of the same mother-trees; the experiment is laid out as randomized blocks repeated ten times; the trees are pruned on the single stem system. Shade is afforded by *Albizzia stipulata* and *Maesopsis eminii*, with *Albizzia maranguensis* as the permanent shade tree. As in Experiment III there are a number of missing trees for which allowance has been made in the analysis. This correction is for differences in numbers only. The records of this experiment were kept by plots up to 1949. Individual tree yields were recorded in 1950 and 1951. Nine mother-trees are represented.

EXPERIMENT IIIA.—ANNUAL AND MEAN YIELDS FOR THE SEVEN YEARS 1945-51 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	1945 16%	1946	*1947	*1948	*1949	*1950	*1951	Mean of 7 years 1945-51 Cwts.
Clones	3·17	Crop Failed	5·45	8·48	10·91	13·11	12·84	7·45
Seedlings	2·06		4·66	9·44	9·43	14·69	10·29	7·21
Mean	2·62		5·06	8·96	10·17	13·90	11·56	7·33
Standard Error	0·23		0·17	0·46	0·53	0·90	0·80	0·18
Significant Difference ... (P=·05)	0·75		0·55	–	–	–	–	–

*Using actual out-turn.

For the seven years period there is no significant difference in yield.

EXPERIMENT V.—MULCH, COMPOST AND NITROGEN—PLANTED 1940

This is a partially confounded 3 x 3 x 3 factorial experiment designed to determine the effects on yield of mulch, compost, and Sulphate of ammonia at three quantity levels separately and in all combinations. The material used for mulching is dried elephant grass. The area is unshaded; the trees, which are unselected clonal material, are pruned on the single stem system.

Treatments (per tree):

Mulch : M0 = Nil.
M1 = 40 lb. dried Elephant Grass.
M2 = 80 lb. dried Elephant Grass.

Compost : C0 = Nil.
C1 = 1 debe (petrol tin) compost.
C2 = 2 debes (petrol tin) compost.

		1940-42	1943-45	1946-49
Nitrogen :	N0 =	Nil	Nil	Nil
	N1 =	1 oz. Sulphate of Ammonia.	2 oz. Sulphate of Ammonia.	3 oz. Sulphate of Ammonia.
	N2 =	2 oz. Sulphate of Ammonia.	4 oz. Sulphate of Ammonia.	6 oz. Sulphate of Ammonia.

The mulch is applied after the long rains; the compost is applied just before the long rains and is lightly forked-in; the sulphate of ammonia is applied after approximately 15 inches of rain have fallen.

The annual yields and also the summary for the years 1942-51, are given below.

EXPERIMENT V.—PLOT YIELDS EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

Mulch	Compost	Nitrogen	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	Mean 1942–51
0	0	0	1·26	0·29	0·45	11·23		7·39	22·75	7·14	18·04	10·62	7·91
0	0	1	1·28	0·55	0·58	11·49		9·27	25·17	8·57	21·22	11·55	8·96
0	0	2	1·00	0·36	0·92	13·65		11·54	21·57	13·39	14·85	14·32	9·15
0	1	0	1·46	0·54	0·95	17·18		12·98	22·39	11·32	18·10	11·34	9·63
0	1	1	1·42	0·51	1·17	14·21		15·14	17·79	15·15	16·02	13·16	9·44
0	1	2	1·35	0·46	0·65	10·39		11·48	19·06	15·34	16·83	12·04	8·71
0	2	0	1·71	0·68	1·03	17·61		10·58	24·69	11·62	18·37	8·14	9·42
0	2	1	1·32	0·37	1·16	14·16		12·95	20·09	13·71	17·32	13·78	9·48
0	2	2	0·42	0·36	0·64	13·29		11·92	17·09	16·02	16·55	16·77	9·33
1	0	0	1·85	0·49	0·88	15·27		8·89	24·76	9·61	14·12	10·10	8·58
1	0	1	1·51	0·59	1·43	14·32		11·30	21·01	11·90	16·71	16·28	9·50
1	0	2	1·48	0·39	1·20	12·83		10·42	17·30	12·67	14·67	12·73	8·41
1	1	0	2·31	0·60	0·97	15·84		12·95	20·41	16·09	16·25	14·09	9·94
1	1	1	2·18	0·78	0·82	18·15		10·00	20·83	12·13	16·47	11·40	8·77
1	1	2	1·42	0·46	1·43	16·17		13·13	22·44	14·81	14·99	13·56	9·83
1	2	0	1·99	0·64	1·49	13·53		15·86	17·45	14·65	18·22	13·96	9·77
1	2	1	1·52	0·47	0·70	13·01		15·14	16·49	15·15	17·49	14·43	9·43
1	2	2	1·65	0·57	1·04	12·18		10·63	22·38	11·91	18·58	12·26	9·06
2	0	0	1·86	0·52	1·01	14·09		14·51	20·91	14·42	14·04	12·29	9·35
2	0	1	1·65	0·56	1·28	13·52		12·22	20·17	14·11	12·86	12·41	8·87
2	0	2	1·38	0·31	0·87	9·47		9·70	19·14	14·18	12·31	14·00	8·08
2	1	0	1·24	0·51	1·15	13·34		10·48	20·81	14·16	15·02	12·51	8·91
2	1	1	1·64	0·31	0·76	14·41		14·09	17·81	13·14	12·29	15·88	9·02
2	1	2	1·56	0·17	0·92	15·30		12·80	17·41	14·63	15·71	11·62	9·03
2	2	0	1·38	0·54	1·24	14·06		11·96	18·82	13·61	18·18	11·11	9·07
2	2	1	1·66	0·61	1·07	10·01		10·81	22·81	10·92	16·05	10·77	8·47
2	2	2	1·67	0·53	1·04	12·96		13·30	16·93	14·30	14·56	12·85	8·80

Crop Failed

EXPERIMENT V.—MEAN YIELD FOR THE TEN YEARS 1942-51 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	N0			N1			N2		
	C0	C1	C2	C0	C1	C2	C0	C1	C2
M0	7·91	9·63	9·42	8·96	9·44	9·48	9·15	8·71	9·33
M1	8·58	9·94	9·77	9·50	8·77	9·43	8·41	9·83	9·06
M2	9·35	8·91	9·07	8·87	9·02	8·47	8·08	9·03	8·80

Standard Error ± 0·38

EXPERIMENT V—MULCH AND COMPOST

	C0	C1	C2	Mean
M0 ...	8·68	9·26	9·42	9·12
M1 ...	8·84	9·52	9·43	9·26
M2 ...	8·78	9·00	8·79	8·86
Mean * ...	8·77	9·26	9·22	9·09

Standard Error for marginal means ± 0·12
*Significant Difference for marginal means ± 0·35
Standard Error for the body of table ± 0·22

EXPERIMENT V—MULCH AND NITROGEN

	N0	N1	N2	Mean
M0 ...	9·00	9·31	9·08	9·12
M1 ...	9·44	9·25	9·11	9·26
M2 ...	9·12	8·79	8·65	8·86
Mean ...	9·18	9·11	8·95	9·09

Standard Error for marginal means ± 0·12
Standard Error for the body of table ± 0·22

EXPERIMENT V—COMPOST AND NITROGEN

	N0	N1	N2	Mean *
C0	8·63	9·12	8·56	8·77
C1	9·50	9·09	9·20	9·26
C2	9·43	9·14	9·08	9·22
Mean ...	9·18	9·11	8·95	9·09

Standard Error for marginal means ± 0·12
*Significant Difference for marginal means ± 0·35
Standard Error for the body of table ± 0·22

EXPERIMENT XV.—IRRIGATION AND MULCH—PLANTED 1940

This is a complex confounded factorial experiment laid out as an 8 x 8 quasi-latin square. It is designed to investigate the effects of irrigation and mulch, both separately and in combination, on coffee culture. The material used for mulching is dried banana trash. The experiment is planted with four different clones, from unselected mother-trees, and the behaviour of these clones is also recorded. They are pruned on the single stem system. The area is unshaded.

TREATMENTS:

Irrigation:

0 = Nil.
1 = Made up to 2 inches effective rainfall monthly.
2 = Made up to 4 inches effective rainfall monthly.
3 = Made up to 2 inches effective rainfall fortnightly.

Mulch:

0 = Nil.
1 = Banana trash 40 lb. per tree at end of long rains.
2 = Banana trash 80 lb. per tree at end of long rains.
3 = Banana trash 40 lb. per tree at end of both long and short rains.

Clone:

1 = KIL 50
2 = KIL 98
3 = KIL 48
4 = KIL 10

The annual yields for the various treatments are given below, together with the summary for the years 1942-51.

EXPERIMENT XV.—PLOT YIELDS

Annual Yields expressed as cwts. Clean Coffee per Acre

Irrigation Mulch	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1942–51 Mean
0 0	0·38	2·22	0·05	2·61	0·30	2·19	15·47	4·26	11·67	7·31	4·57
0 1	1·42	5·76	1·72	1·97	1·21	8·31	20·81	8·88	14·39	7·90	7·24
0 2	1·61	6·11	1·88	1·21	0·44	8·28	21·14	7·93	14·86	8·41	7·21
0 3	1·35	5·53	2·67	1·10	0·70	7·48	17·29	9·48	13·76	6·86	6·60
1 0	0·66	4·95	2·55	1·54	3·42	12·43	12·33	15·00	7·33	9·04	6·93
1 1	1·80	8·29	2·99	0·86	4·33	17·76	16·63	18·79	8·31	9·19	8·89
1 2	2·03	9·32	2·87	1·80	1·95	14·65	16·97	14·22	7·87	9·08	8·06
1 3	1·76	7·97	3·24	1·34	4·20	16·69	15·75	15·20	9·85	8·90	8·51
2 0	0·86	6·46	2·94	1·56	3·75	12·54	11·06	18·05	4·92	9·55	7·20
2 1	1·72	9·57	3·26	1·04	3·68	15·10	14·29	18·10	6·84	10·79	8·44
2 2	2·43	7·94	2·33	0·97	3·00	15·10	16·25	16·17	6·61	9·98	8·08
2 3	1·70	6·87	3·46	1·17	3·14	15·21	17·32	13·76	7·92	9·84	8·05
3 0	1·10	5·11	2·85	1·07	1·92	12·55	8·39	16·04	5·58	5·69	6·10
3 1	1·96	7·44	2·76	0·20	3·85	17·97	14·25	15·05	10·58	8·31	8·39
3 2	2·22	7·02	4·27	0·54	3·42	18·08	15·37	16·12	9·20	9·03	8·52
3 3	1·59	5·75	4·08	0·70	2·96	17·40	15·39	12·87	8·78	8·46	7·80

EXPERIMENT XV.—MEAN YIELD FOR THE TEN YEARS, 1942–51, EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

IRRIGATION AND MULCH

MULCH	IRRIGATION 0	1	2	3	Mean *
0	4·57	6·93	7·20	6·10	6·20
1	7·24	8·89	8·44	8·39	8·24
2	7·21	8·06	8·08	8·52	7·97
3	6·60	8·51	8·05	7·80	7·74
Mean *	6·40	8·09	7·94	7·70	7·54

*Significant Difference for marginal means ± 0·53
Standard Error for marginal means ± 0·18
Standard Error for entries in body of table ± 0·36

EXPERIMENT XV.—IRRIGATION AND CLONE

CLONE	IRRIGATION 0	1	2	3	Mean *
(1) KIL 50 ...	5·20	7·31	6·78	6·70	6·50
(2) KIL 98 ...	6·33	8·56	7·52	8·07	7·62
(3) KIL 48 ...	7·46	8·13	8·44	7·89	7·97
(4) KIL 10 ...	6·63	8·39	9·04	8·15	8·05
Mean * ...	6·40	8·09	7·94	7·70	7·54

*Significant Different for marginal means ± 0·53
Standard Error for marginal means ± 0·18
Standard Error for entries in body of table ± 0·36

EXPERIMENT XV.—MULCH AND CLONE†

CLONE	MULCH 0	1	2	3	Mean *
(1) KIL 50 ...	5·08	7·40	6·18	7·34	6·50
(2) KIL 98 ...	6·65	8·17	7·68	7·97	7·62
(3) KIL 48 ...	6·26	8·86	8·79	8·01	7·97
(4) KIL 10 ...	6·81	8·52	9·22	7·64	8·05
Mean * ...	6·20	8·24	7·97	7·74	7·54

*Significant Difference for marginal means ± 0·53
†Significant Difference of entries in body of table ± 1·06
Standard Error for marginal means ± 0·18
Standard Error for entries in body of table ± 0·36

EXPERIMENT XIVA.—MULCH—PLANTED 1940

Laid out as a 5 x 5 latin square, with split plots to show the effects of sulphate of ammonia, this experiment is designed to determine the effects on yield of banana trash, guinea grass (*Panicum maximum* and elephant grass (*Pennisetum purpureum*) applied as mulches, compost made from an equivalent amount of elephant grass, and clean cultivation. The trees are clonal material from unselected mother trees and are pruned on the single stem system. The area is sparsely shaded with *Albizzia maranguensis* as the permanent shade tree.

TREATMENTS:

A—Control—routine clean cultivation.
B—Banana trash (80 lb. per tree).
C—Elephant grass (80 lb. per tree).
D—Guinea Grass (80 lb. per tree).
E—Compost (80 lb. per tree).

Sulphate of Ammonia (Sub-plots):

1941-42—2 oz. per tree.
1943-44—4 oz. per tree.
1946-48—8 oz. per tree.

As in Experiment V, the mulches (dried material) are applied after the long rains; the compost is applied just before the long rains and is lightly forked in; the Sulphate of Ammonia is applied after approximately 15 inches of rain has fallen.

The yearly results and the mean for the nine year period 1942-51 are given below.

Over the whole period of the experiment no significant differences in yield have resulted from the application of Sulphate of Ammonia, mulches or compost. It should be noted that only the E plots (compost) were treated in 1951.

MAIN PLOTS

	A	B	C	D	E	Mean	Standard Error
Cwts. per acre ...	7·41	8·74	8·39	8·45	8·10	8·22	0 34
Percentage ...	90	106	102	103	99	100	4

EXPERIMENT XIV A

ANNUAL AND MEAN YIELDS FOR THE TEN YEARS 1942-51 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

N1 = Plots to which Sulphate of Ammonia applied.
N0 = Plots to which no Sulphate of Ammonia applied.

	1942		1943		*1944		*1945		*1946		*1947		*1948		*1949		*1950		*1951		Mean of 10 years 1942-51	
	Sub-plots		Sub-plots		Sub-plots		Sub-plots		Sub-plots		Sub-plots		Sub-plots		Sub-plots		Sub-plots		Sub-plots			
	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0	N1	N0
Treatments:																						
A Nil	1·80	1·66	4·68	5·04	0·04	0·07	11·82	9·43	0·06	0·23	11·50	14·35	5·92	6·38	12·99	16·58	5·39	5·48	16·28	18·13	7·12	7·71
B. Banana mulch (80 lb. per tree) ...	1·87	2·31	4·09	4·82	0·36	0·48	11·90	10·77	0·36	0·90	13·30	15·97	8·33	8·02	15·93	17·83	6·30	7·27	22·36	21·63	8·47	8·99
C. Elephant Grass (80 lb. per tree)...	1·73	1·80	4·55	4·67	0·23	0·50	11·50	12·40	0·13	0·19	14·76	14·64	5·78	7·49	14·65	21·39	5·32	5·61	22·39	19·55	8·07	8·69
D Guinea Grass (80 lb. per tree) ...	1·90	2·21	4·18	5·87	0·35	1·53	11·25	6·40	0·35	0·83	16·89	15·14	6·70	7·73	16·84	16·34	4·43	5·89	22·34	20·84	8·49	8·42
E. Compost (1 debe per tree) ...	1·22	1·29	4·23	5·63	0·06	0·10	10·75	10·52	0·03	0·44	17·03	13·18	4·73	6·75	16·60	15·40	9·68	7·49	19·26	18·41	8·34	7·86
Mean	1·70	1·85	4·34	5·21	0·25	0·61	11·44	10·30	0·19	0·44	14·70	14·46	6·49	7·27	15·40	17·51	6·22	6·35	20·52	19·71	8·09	8·34
Standard Error	0·009	0·009	0·13	0·13	0·329	0·329	0·409	0·409	0·070	0·070	1·229	1·229	0·740	0·740	1·32	1·32	0·82	0·82	1·12	1·12	0·36	0·36
Significant Difference (P=·05) ...	–	–	0·36	0·36	–	–	1·208	1·208	0·207	0·207	3·627	3·627	–	–	3·88	3·88	–	–	–	–	–	–

*Results calculated on actual out-turn basis. Remainder on 16%.

EXPERIMENT IX—CULTIVATION—PLANTED 1934

Laid out as a 5 x 5 latin square, the object of this experiment is to determine the effect of the various methods of cultivation. The experiment was planted with the seedling progeny of a planter's selection from a district remote from the Kilimanjaro-Meru coffee growing areas. It was originally grown on the single stem system without shade, but in 1944 it was converted to multiple stem. It is sited on sloping land, which had been previously terraced, with a western aspect.

TREATMENTS:

A. Forked jembe (forked hoe).
B. Jembe (West Indian hoe).
C. No cultivation.
D. Envelope forking.
E. Trenching.

EXPERIMENT IX

ANNUAL AND MEAN YIELDS FOR THE FOURTEEN YEARS 1938–51 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	*1938	*1939	*1940	*1941	*1942	*1943	1944	*1945	1946	†1947	†1948	†1949	†1950	†1951	Mean of 14 years 1938-51	
Treatment:							Converted to multiple stem		Crop Failed						Cwts.	Per-cent-ages
A. Forked hoe (forked jembe)	5·77	0·27	2·60	9·23	1·86	7·86		6·28		24·17	1·52	17·09	9·45	13·68	6·18	113
B. West Indian hoe (jembe)	5·79	0·48	2·74	8·23	2·43	7·73		6·60		22·14	0·68	14·99	6·40	11·87	5·61	102
C. No cultivation ...	5·61	0·41	2·20	9·16	1·90	7·17		5·79		17·79	1·14	13·45	6·75	12·24	5·13	94
D. Envelope forked ...	4·55	0·35	1·67	7·32	1·63	5·26		5·29		21·47	1·28	17·86	7·21	13·43	5·40	99
E. Trenching	4·81	0·45	2·11	9·33	1·38	5·80		5·24		19·49	0·12	16·10	5·75	11·28	5·04	92
Mean	5·31	0·39	2·26	8·66	1·84	6·76		5·84		21·01	0·95	15·90	7·11	12·49	5·47	100
Standard Error ...	–	–	0·34	0·33	0·10	0·12		0·62		1·689	0·268	0·716	0·77	0·91	0·32	6
Significant Difference (P=·05)	–	–	1·05	–	–	–		–		–	0·825	2·23	2·36	–	–	–

*16% Out-turn.

†Actual Out-turn.

Over the period of fourteen years there is no significant difference between the yields of the plots under the various treatments.

EXPERIMENT XIII.—METHOD OF PRUNING—PLANTED DECEMBER, 1935

This experiment is laid out as 3 x 3 latin square, repeated three times in different parts of the Station. It is designed to compare three systems of pruning arabica coffee. Two of the replicates are lightly shaded with *Albizzia maranguensis;* the third is unshaded. The experiment is planted with seedling material.

TREATMENTS:

S = Single stem.
M/3 = Multiple stem—3 suckers.
M/A = Multiple stem—Agobiada—3 suckers.

The yearly results, together with the summary, for the period 1938-51 are shown below.

EXPERIMENT XIII

ANNUAL AND MEAN YIELDS FOR THE FOURTEEN YEARS 1938–51 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

Treatments:	*1938	*1939	*1940	*1941	*1942	*1943	*1944	*1945	*1946	*1947	*1948	*1949	*1950	*1951	Mean of 14 years 1938-51	
															Cwts.	Per-cent-ages
Single stem	Fly Crop	1·982	2·996	7·290	3·951	5·318	5·319	9·389	1·04	20·492	9·318	15·052	12·362	15·81	7·76	88
Multiple stem, 3 suckers ...		2·348	11·928	12·962	12·034	17·238	5·677	7·079	2·30	29·578	5·056	12·701	13·446	16·24	10·63	121
Agobiada, Multiple stem, 3 suckers		0·407	6·607	6·370	7·494	13·079	4·992	8·028	0·90	17.329	10·987	13·840	7·272	16·53	8·07	96
Mean		1·579	7·177	8·874	7·840	11·878	5·329	8·232	1·41	22·467	8·454	13·864	10·745	16·19	8·82	100
Standard Error		0·301	0·493	0·700	0·401	0·843	0·127	1·013	0·312	0·410	0·764	0·552	2·108	1·11	0·26	3
Significant Difference (P=·05) ...		1·043	1·707	2·422	1·389	2·918	0·440	–	1·256	1·419	2·642	–	–	–	0·88	10

*Using actual out-turn

For the whole period of the experiment the Multiple Stem system has outyielded that of the single stem system and the difference is significant at P=0·001.

EXPERIMENT XX

This experiment is laid out as randomized blocks repeated six times. It is designed to study the effects of the time of pruning on coffee grown on the single stem system.

The coffee in which the experiment is being carried out consists of seedlings of both Kents and Bourbon, and was planted in 1936. It is well shaded by *Albizzia maranguensis* and *Rauvolfia inebrians*.

The treatments were commenced at the end of 1948.

TREATMENTS:

A. Pruned during month in which harvesting is completed.
B. Pruned one month later than A.
C. Pruned one month later than B.
D. Pruned one month later than C.
E. Pruned one month later than D.
F. Pruned one month later than E.

EXPERIMENT XX

ANNUAL AND MEAN YIELDS FOR THE YEARS 1949-51 EXPRESSED AS CWTS. OF CLEAN COFFEE PER ACRE

	*1949	*1950	*1951	Mean of 3 years 1949–51	Percentage
A.—Pruned during month in which harvesting completed	12·93	8·79	17·61	13·11	127
B. }	11·60	7·14	15·61	11·46	111
C. }	9·53	8·67	11·71	9·97	97
D. } Successive months	8·24	8·31	13·24	9·93	96
E. }	8·85	5·44	12·69	9·00	87
F. }	9·53	5·66	9·59	8·27	80
Mean	10·11	7·33	13·41	10·31	100
Standard Error	0·79	1·65	0·99	0·64	6
Significant Difference (P=·05)	2·30	—	2·89	1·85	18

*Using actual out-turn.

VEGETATIVE PROPAGATION

GENERAL.

During the year 17,256 cuttings were taken; of these 14,750, or 85·48%, rooted within six months of the date of setting. Losses during the hardening-off process were greatly reduced, and amounted to only 702 young rooted cuttings, or 4·76%, of those rooted. The progress made during the last four years is summarised in the following table:—

SUMMARY OF RESULTS (FOUR YEARS) 1948-51

Year	Cuttings Planted	Rooted within 6 Months		Died after Rooting	
		No.	Percentage	No.	Percentage
1948	24,163	8,806	36·44	NOT RECORDED	
1949	13,287	8·770	66·00	1,393	15·88
1950	19,391	15,821	81·59	1,316	8·32
1951	17,256	14,750	85·48	702	4·76

EXPERIMENTAL.

(1) *Experiment 1/51*—In view of the success with single-node cuttings of both tea and coffee elsewhere, an experiment was laid down to compare single-node stem cuttings of *C. arabica* with tip cuttings and with the normal entire soft-wood cuttings. Details of the treatments were as follows:—

A—Basal single-node cutting—semi-hard at base.
B—Central single-node cutting—soft at base.
C—Normal entire soft-wood cutting—Control.
D—Soft tips (two pairs of leaves).

The experiment was laid out in the propagating frames with material from one clone in four randomized blocks, each block having four plots of fifty cuttings in each. Each cutting was severed at the internode and split up to the node. The experiment was concluded after twenty-four weeks in the frames.

The results are summarized in the following table:—

	A	B	C	D	Mean	Standard Error	Significant Difference (P=·01)
Degrees	51·4	66·87	83·07	65·7	66·76	3·13	14·39
Percentages ...	61·0	83·5	98·0	81·0	80·88	–	–

Thus, under the propagating conditions at this Station, the normal entire softwood cuttings rooted more satisfactorily than single-node cuttings or soft tip cuttings, and provided that adequate material is available, the continuance of its use is recommended. A possible explanation of the comparative failure of the single-node cuttings is that they have only one pair of original leaves; if these become infected with leaf disease or a pest, the leaf area is reduced below the minimum necessary for a successful rooting, whereas the entire cuttings have more leaves and any losses are not so disproportionate.

(2) *Experiment 2/51*—Now that a technique has been devised which gives a reasonable percentage of cuttings rooted without artificial aids, it was decided to test once again the effect of growth substances on the rooting of coffee cuttings. Alpha-naphthalene-acetic acid, dissolved in fifty per cent ethyl alcohol, was used at the following strengths:—

A—1000 p.p.m.
B—500 p.p.m.
C—250 p.p.m.
D—Control—no treatment.

The concentrated dip method of application of the treatments was used. The experiment was laid out in the propagating frames in four randomized blocks, each block having four plots of fifty cuttings each. Each plot was represented by twenty-five cuttings of each of the two clones N 29 and N 71. The duration of the experiment was twenty-four weeks from the date of setting.

The results are summarised in the following tables:—

(a) **Percentage rooted**

Clone	A	B	C	D	Mean
N 29	95·0	94·0	93·0	89·0	93·0
N 71	90·0	98·0	96·0	89·0	93·0
Mean	92·5	96·0	94·5	89·0	93·0

Standard Error for body of table =3·59 (in degrees). Not significant.

N.B.—For purposes of analysis the percentages were transformed to degrees.

(b) **Time taken to root in weeks**

Clone	A	B	C	D	Mean
N 29	12·4	13·5	13·3	14·6	13·5
N 71	13·7	14·2	14·5	17·6	15·0
Mean	13·0	13·8	13·9	16·1	14·2

	Standard Error		Significant Difference
Clones...	± 0·36	...	1·16 (P=·05)
Treatments	± 0·26	...	1·20 (P=·01)
Clones x treatments	± 0·72	...	not significant.

Thus, treatment with alpha-naphthalene-acetic acid has significantly hastened the rooting time, and N 29 has taken significantly less time to root than N 71.

Rooting throughout the experiment was of a high order and it was not therefore to be expected that rooting itself would be much improved. The hastening of the rooting process is now the most important factor and it is encouraging to find that this object was achieved in this experiment, though still quicker rooting is necessary. Further experiments to this end are contemplated.

In this same experiment, for the first time, an analysis of the average number of roots per cutting was made. The results are shown in the following table:—

Average numbers of roots per cutting

Clone	A	B	C	D	Mean
N 29	5·00	4·48	4·72	4·58	4·70
N 71	5·39	4·80	5·02	4·85	5·01
Mean	5·20	4·64	4·87	4·72	4·86

Standard Error for body of table =0·34. Not significant.

Although the treatment differences are not significant, it is interesting to note that there is a highly significant negative correlation between the time taken to root and the average number of roots per cutting (r= – 0·963; P=·01). Thus, the longer the cuttings took to root, the less were the average number of roots per cutting.

(3) *Experiment 3/51*—In this experiment twenty-five cuttings each of five different clones were planted each month, each clone having its own frame. It was hoped that it might be possible to separate out the influences of (a) condition of cutting, or seasonal effect, at time of planting and (b) seasonal effect on rooting. The results to date indicate some difficulty in separating these influences; the experiment is being continued and a new series has been started in addition to the old. It is also hoped that some indication of clonal differences in rooting response, and the rate of deterioration of the rooting medium may be shown in this experiment.

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STATEMENT SHOWING GRADES AND CLASSIFICATION OF THE 1951-52 CROP

	Tons
Total estimated crop expressed as clean coffee	71·50
This total is made up as follows:—	
Lots 1-10 inclusive, sent to Curing Works	60·79
Floats, hand pickings, washed seed, etc. (lots 11-13)	7·11
Clean coffee equivalent to 2,461 lbs. of seed distributed	0·82
Coffee samples, etc.	1·30
Buni...	1·48
	71·50

The grading and classification of lots 1-13 amounting to 67·90 tons of clean coffee was:—

	GRADING lb.	PERCENTAGE		CLASSIFICATION lb.	PERCENTAGE
AA. ...	42,025	27·6	1... ...	— ...	—
A	72,491	47·7	2... ...	21,852 ...	14·4
PB ...	8,317	5·5	3... ...	72,797 ...	47·9
B	14,482	9·5	4... ...	28,681 ...	18·9
E	1,438	0·9	5... ...	9,473 ...	6·2
C	2,462	1·6	6... ...	10,748 ...	7·1
T	3,806	2·5	7... ...	3,562 ...	2·3
TT ...	6,245	4·1	8... ...	1,287 ...	0·8
HP ...	814	0·5	9... ...	2,402 ...	1·6
			10... ...	510 ...	0·3
			11... ...	245 ...	0·2
			12... ...	523 ...	0·3
			13... ...	— ...	—
	152,080			152,080	

= 67·90 Tons

Of the crop 80·8% was AA's, A's and PB's; and 81·2% was better than class 5

MONTHLY RAINFALL FROM SEPTEMBER 1944 TO END OF AUGUST 1951 IN INCHES

	September 1944 to end of August 1945	September 1945 to end of August 1946	September 1946 to end of August 1947	September 1947 to end of August 1948	September 1948 to end of August 1949	September 1949 to end of August 1950	September 1950 to end of August 1951
September ...	2·42	0·20	7·34	1·23	0·30	0·33	1·87
October	3·15	0·05	4·71	1·27	2·51	0·69	0·80
November ...	3·10	4·66	1·13	0·93	1·65	0·26	0·88
December ...	5·14	0·30	2·19	1·31	6·19	1·38	0·91
January	1·72	0·02	2·01	0·46	1·79	2·06	4·19
February ...	1·39	1·14	0·72	0·71	4·17	3·01	2·58
March	4·85	0·57	3·37	2·72	0·10	7·09	3·20
April	15·19	16·50	18·45	14·50	9·34	16·20	20·45
May	21·34	22·74	25·73	15·56	10·64	24·96	19·38
June	3·45	2·54	10·97	2·93	0·92	5·09	7·20
July	3·15	0·59	1·43	1·53	1·86	1·81	2·09
August	1·33	1·03	1·38	0·44	0·82	0·88	1·60
Total (in inches)...	66·23	50·74	89·43	43·59	40·29	63·76	65·15

Rainfall for remaining months of 1951. (in inches). September 0·24. October 2·40. November 8·65. December 4·89.